

REMARKS

Claims 1-67 are all the claims pending in the application. Claims 56-63 have been withdrawn from consideration by the Examiner as being drawn to a non-elected invention. New claim 67 has been added to further define the invention. Reconsideration and allowance of all the claims are respectfully requested in view of the following remarks.

Drawings

The Examiner strongly advises Applicants to use the correct shading in the drawings, but makes no objection or rejection to them. Upon indication of allowable subject matter, Applicants will correct the shading in the drawings.

Claim Rejections - 35 U.S.C. § 103

The Examiner rejected claims 1-55 and 64-66 under §103(a) as being unpatentable over US Patent 5,212,496 to Badesha et al. (hereinafter Badesha) in view of US Patent 5,124,716 to Roy et al. (hereinafter Roy). Applicants respectfully traverse this rejection because the references fail to establish *prima facie* obviousness in that they do not teach or suggest every element as set forth in Applicants' claims.

One embodiment of the present invention relates to an ink jet recording head for jetting ink drops via the displacement of a piezoelectric element. With reference to Fig. 2, the ink jet recording head is of the type having a flow passage formation substrate 10 in which a pressure generation chamber 12 and a nozzle opening 11 are formed. A diaphragm 50 is provided on the flow passage formation substrate 10. The diaphragm 50 defines an interior wall of the pressure generation chamber 12. A piezoelectric element 300 is provided on the diaphragm 50. The piezoelectric element 300 has a lower electrode 60, a piezoelectric layer 70, and an upper electrode 80.

As recited in claim 1, an important feature of the present invention is that the ink jet recording head includes a compression film having (i) a compressive stress and (ii) at least a part in

a thickness direction removed in an area opposed to the pressure generation chamber 12, thereby forming a removal part. The compression film may form a variety of elements in the ink jet recording head depending on the particular embodiment. For example, Fig. 6 shows the compression film forming the elastic wall 50 (or diaphragm), Fig. 16 shows the compression film forming the lower electrode 60, Fig. 18 shows the compression film forming the upper electrode 80, and Fig. 24 shows the compression film forming the conductive film 65.

The Examiner asserts that Badesha teaches all of the features set forth in claim 1, except for a piezoelectric driver. More specifically, the Examiner asserts that at least one of a diaphragm (col. 11, lines 7-61) and an acoustic heating driver element 34, includes a compression film having a compressive stress.¹ But the Examiner's interpretation of Badesha is, respectfully, wrong.

Contrary to the Examiner's assertion, col. 11, lines 7-61 merely discloses various films such as, for example, silicon dioxide thermal oxide layer 17, thick film type insulative layer 18, and passivation layer 16. However, Badesha does not teach or suggest that any of these films is a compression film, or that any of these films includes a compressive stress.

Further, Badesha discloses that the acoustic heating driver elements 34 are patterned on surface 30 of the heating element plate 28, and are positioned in each channel formed by grooves in the lower substrate or heater plate.² Again, Badesha does not teach or suggest that these heating driver elements, or the layers on which they are disposed, are a compression film, or even include a compressive stress. In fact, Badesha does not even use the terms "compression film" or "compressive stress" anywhere through his specification.

Thus, with respect to the compression film having a compressive stress, the Examiner's position is speculative at best. Of course the Examiner may be relying upon an inherency theory,

¹ Office Action at page 2, item 3, paragraph 2.

² Badesha at col. 9, line 53 - col. 10, line 26.

but if this were the case, then she should have at least set forth a cogent line of technical reasoning as to why the relied upon layers in Badesha would necessarily have a compressive stress. In this case, the Examiner has not provided any reasoning whatsoever. At least in this respect, the Examiner has not even established a *prima facie* case of obviousness.

Moreover, the specification indicates that the compressive stress is achieved via specific processing steps. For example, when the compression film forms the elastic film 50, a zirconium layer is formed on the substrate by sputtering, and then thermal oxidation processing occurs in oxygen at a high temperature to achieve a monoclinic system. During oxidation, the zirconium is heated to a phase transition temperature or more. Therefore, when cooled, a transition occurs resulting in the zirconium oxide having a compressive stress.³ The specification also provides the processing details to achieve the compressive stress when the compression film forms other layers in the ink jet recording head.⁴

By sharp contrast to the present invention, Badesha does not indicate any specific processing steps that would lead to a compressive stress in the relied upon layers. Rather, Badesha merely indicates the locations of these layers, their respective functions (which do not include providing a compressive stress), and exemplary materials that may be used to form the layers. Certainly then, the compressive stress feature defined by claim 1 is not at all taught or suggested by Badesha. The Examiner's assertions to the contrary are simply unfounded.

The Examiner then cites Roy as teaching a piezoelectric driver. But Roy does not at all teach or suggest a compression film having a compressive stress, let alone that such is one of a diaphragm and a piezoelectric element, as set forth in claim 1.

³ Specification, paragraph bridging p. 13-14.

⁴ When the compression film forms the lower electrode 60, see p. 21, 1st paragraph. When the compression film forms the upper electrode 80, see p. 22, 5th and 6th paragraphs.

Therefore, even assuming, *arguendo*, one of ordinary skill in the art were motivated to combine Badesha and Roy as suggested by the Examiner, any such combination would still not render obvious Applicants' claim 1. Likewise, dependent claims 2-55 and 64-66 are not rendered obvious by Badesha in view of Roy.

Miscellaneous Matters

The Examiner asserts that Applicants have not presented any "evidence, i.e. 37 CFR 1.132" that the materials used by the prior art do not have a compressive stress as compared to the materials used by the Applicants.⁵ However, because the Examiner has failed even to establish *prima facie* obviousness, Applicants are under no obligation to present any evidence of non-obviousness. Specifically, because the Examiner has not presented any teaching or suggestion of a compression film having a compressive stress, Applicants are under no obligation to present evidence that the references do not teach or suggest such an element. Nonetheless, Applicants have presented—in the Amendment filed on January 10, 2002—articles explaining that not all materials include a compressive stress.

Conclusion

Claim 67 has been added to further define the invention. Claim 67 sets forth that the compression film includes the compressive stress pre-established therein. For reasons similar to those outlined above, Badesha and Roy do not teach or suggest such a feature.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

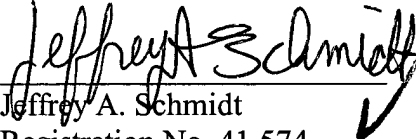
⁵ Office Action at page 2, item number 5.

AMENDMENT UNDER 37 C.F.R. § 1.111
US Appln. 09/199,816

Atty. Docket: Q52241

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,


Jeffrey A. Schmidt
Registration No. 41,574

SUGHRUE MION, PLLC
2100 Pennsylvania Avenue, N.W.
Washington, D.C. 20037-3213
Telephone: (202) 293-7060
Facsimile: (202) 293-7860

Date: July 1, 2002

AMENDMENT UNDER 37 C.F.R. § 1.111
US Appln. 09/199,816

Atty. Docket: Q52241

APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Claim 67 has been added as a new claim.